

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
10 February 2005 (10.02.2005)

PCT

(10) International Publication Number  
**WO 2005/013377 A1**

(51) International Patent Classification<sup>7</sup>: **H01L 31/0352**,  
31/0248, C30B 15/00, 21/06

(74) Agents: **BROWN, Kevin C.** et al.; Burr & Brown, P.O.  
Box 7068, Syracuse, New York 13261-7068 (US).

(21) International Application Number:  
PCT/US2004/023869

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(22) International Filing Date: 26 July 2004 (26.07.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/490,125 25 July 2003 (25.07.2003) US

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (*for all designated States except US*): **GE ENERGY (USA) LLC** [US/US]; 231 Lake Drive, Newark, Delaware 19702 (US).

(72) Inventors; and

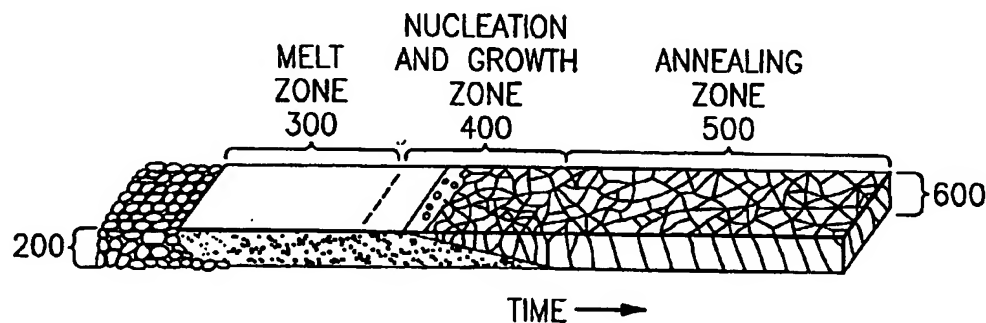
(75) Inventors/Applicants (*for US only*): **JONCZYK, Ralf** [DE/US]; 12 Glenberry Drive, Wilmington, Delaware 19808 (US). **KENDALL, Scott L.** [US/US]; 317 Baker Drive, Lincoln University, Pennsylvania 19352 (US). **RAND, James A.** [US/US]; 209 Evergreen Court, Landenberg, Pennsylvania 19350 (US).

Published:

— with international search report

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: SEMICONDUCTOR ELEMENTS HAVING ZONES OF REDUCED OXYGEN



(57) Abstract: There is provided a structure comprising semiconductor material (600), the structure having at least one zone of reduced oxygen concentration, such zone having an interstitial oxygen concentration of not greater than  $3 \times 10^{17}$  oxygen atoms/cm<sup>3</sup>, such zone extending at least 75 microns in depth from a first major surface. There is further provided a photovoltaic cell comprising at least one such structure.

BEST AVAILABLE COPY

WO 2005/013377 A1